

THE PUBLIC GARDENS AND PLANTATIONS OF JAMAICA.¹

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INTRODUCTION.

JAMAICA is about ninety miles south of Cuba. Its most western point is nearly directly south of Toronto, as it lies between $78^{\circ} 20' 50''$ and $76^{\circ} 11'$ W. long. It is situated between $18^{\circ} 32'$ and $17^{\circ} 43'$ N. lat., so that it is only one to two degrees nearer the equator than the City of Mexico ($19^{\circ} 25'$), and a little farther from the equator than Belize. It is a very small island, being only 144 miles long and forty-nine miles wide in its broadest part; its area amounts only to 4,207 square miles, of which very little is flat, and a great deal is not suitable for cultivation.

The aboriginal name of Jamaica was Xaymaca, denoting "a land covered with wood, and watered by shaded rivulets." The character expressed by the name is what one might expect to find in an island with lofty mountains, its shores bathed by the Gulf stream, and lying in the path of the trade winds. The general trend of the mountain ranges being at an angle to the direction of the prevailing winds, there is considerable precipitation nearly all the year round in some parts, while in other districts a small amount of rain falls during a few days only in two months of the year.

The general features of the landscape and of the flora which clothes it have been developed by the position of the island, and its geological history. The lowest strata containing fossils are the Hippurite limestone of the Cretaceous series. Below this there is a series of metamorphosed shale, sandstone and conglomerate, with dikes of intrusive diorite, syenite and granite.

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Above the Hippurite limestone are beds of black shale, 1000 feet in thickness, overlaid by a trappean series, all of which are placed by Sawkins in the Eocene age. Then follow the yellow limestone of Miocene times, white limestone of very recent age, and marl, coast lime, and alluvium of post Tertiary times.

The differences in elevation from sea level to the 7423 feet of the Peak, the various exposures to sunlight, the abundance or the want of rain and dew, the geological formations, all have their influences on plant life, and make the conditions of existence of the most diversified character, and the cultivation of economic plants from all parts of the world an easier task than in most other places.

HISTORY OF THE GARDENS.

The first botanic garden in Jamaica was formed about 150 years ago by a private individual, Mr. Hinton East, on his property near the present village of Gordon Town, nine miles from Kingston. After it had been in existence for some years, in 1774 Sir Basil Keith became governor, and determined on the formation of two government botanic gardens, one a "European garden," and the other a "Tropical garden." In December of the same year a committee of the legislature recommended that £700 be appropriated for the purchase of a piece of land proper for a botanic garden, and that £300 sterling be provided for the annual salary of a botanist.

In 1775 a property named Endfield, adjoining Mr. East's garden, was purchased and Dr. Thomas Clarke came out "at the particular instance and request" of Sir Basil Keith, as island botanist, and to take charge of the gardens. Dr. Clarke introduced in 1775 the China tea plant, camphor, litchi, *Cycas circinalis* (the "sago palm"), and *Desmodium gyrans*; in 1778 *Blighia sapida* (Akee); and in 1779 the clove tree. Endfield being a "steep hillside" proved unsuitable, and in 1778 a law was passed to purchase land for a botanic garden at or near Bath. The botanic garden at Bath was founded in 1779 and placed under the care of Dr. Thomas Clarke.

In June 1782 Captain Marshall, of H. M. S. *Flora*, one of Lord Rodney's squadron, captured a French ship bound from Mauritius for Haiti, carrying a number of plants of economic value. The ship was sent as a prize to Jamaica, and Captain Marshall "with Lord Rodney's approbation" deposited the whole collection in Mr. East's garden. Many plants were new introductions, and amongst these were the mango, cinnamon, and jack fruit.

On Mr. East's death in 1790, the Liguanea garden was offered by his nephew to the assembly as a public garden at their own price. It was purchased under the authority of an act of the Assembly, the preamble stating that the garden in Bath was insufficient in extent, and was besides liable to be carried away by the river which had destroyed two-thirds of the town.

In 1793 Captain Bligh in H. M. S. *Providence* brought several hundred plants of the breadfruit and other valuable plants from Otaheite for the West Indies. These were distributed to the gardens at Liguanea and Bath, and to other centers, and committees were appointed to make arrangements for their reception, the care of them, and their distribution. One of the gardeners, James Wiles, who had circumnavigated the globe with Captain Bligh, was appointed to the care of the Liguanea garden, and writing to Sir J. Banks in 1793, he says:

All the trees under my charge are thriving with the greatest luxuriance. Some of the breadfruit are upwards of eleven feet high, and my success in cultivating them has exceeded my most sanguine expectations. The cinnamon tree is become very common, and mangoes are in such plenty as to be planted in the negro grounds.

In 1782 Dr. Thomas Dancer was elected physician of the Bath of St. Thomas the Apostle; in 1788 he was appointed by the legislature superintendent of the Bath garden; and in 1797 island botanist. The duties of the island botanist were defined as follows:

To collect, class, and describe the native plants of the island; to use his endeavors to find out their medicinal virtues; to discover if they possess any qualities useful to the arts, and annually to furnish the House with a correct list of such plants as are in the botanic gardens, together with such information as he may have acquired relative to their uses and virtues.

In 1799 Dr. Dancer went to practice in Kingston. He made the medicinal plants of the island a special study, and published in 1801 "The medical assistant, or Jamaica practice of physic." He died in 1811.

The colony had now to undergo a period of difficulty and distress, as the slave trade was abolished in 1807 without compensation to the planters, and the wars with France and the United States caused great depression. Accordingly in 1810 the Liguanea garden was sold, and that at Bath was never afterwards adequately supported.

In 1825 Dr. Jas. MacFadyen was appointed island botanist. In 1837 appeared the first volume of his *Flora of Jamaica*; in 1850 part of the second volume was printed, and this was all that was published. He did not retain his appointment long; and in 1828 Thomas Higson was appointed island botanist and curator of the botanic garden at Bath. He presented to the garden a collection of living plants collected by himself in South America.

In 1829 the garden at Bath, of one and three-fourths acres, was increased by three acres to the west. Higson left Bath in 1832; and in 1846 Nathaniel Wilson was appointed island botanist with the care of Bath garden. Wilson had been in the gardens at Kew and at Kensington for several years, and was a most capable man. He kept up a correspondence with Sir W. J. Hooker, director of Kew gardens, and introduced a very large number of plants from Kew and other parts of the world, trusting to be repaid his expenditure by the liberality of the assembly. *Bæhmeria nivea* was imported by him, and he formed a very extensive collection of fiber plants. He also received from Kew in 1846 and 1847 the mangosteen, litchi, durian, and *Musa Cavendishii*. In 1849-1850 he reports the arrival of *Poinciana*, *Spathodea*, *Bougainvillea spectabilis*, *Cæsalpinia Sappan*, *Amherstia*, and Assam tea.

In 1851 there was some intention of moving the site of the garden elsewhere, and Wilson, referring to Bath, says in his report for that year:

I would most unhesitatingly say that a more congenial climate for the growth and propagation of plants is not to be met with in the island. The humidity of the atmosphere is proverbial and suitable to a peculiar degree for plants in general.

In 1856 the Sulphur river inundated the garden for the fifth time since 1848 and destroyed half an acre. These floods and the impossibility of extending the garden for the growth of additional plants were constant difficulties with Wilson, and in 1858 he says :

The attention of the executive has of late been pointedly directed towards it [the garden] with a view not only to place the establishment on a scale of permanent efficiency, but in a more central locality, accessible from all parts of the island The want of a more central and extensive depot has long been felt, particularly at the west end and north side of the island, where distance renders it impracticable to convey plants safely, and where industrial institutions and experimental gardens are springing up.

In 1860 the legislature appropriated money for the purchase of Castleton, and Wilson was entrusted with the formation of a garden there, on the understanding, however, that the garden at Bath was to be maintained for supply of seeds to Castleton, and plants for general distribution. In his report for 1861, he states that Sir W. J. Hooker had sent out the previous year seeds of *Cinchona succirubra*, *C. nitida*, and *C. micrantha*, and that several hundred plants were ready for planting out. At this time the market price for succirubra bark was 6s. per lb. In 1862-63 an assistant to Mr. Wilson was appointed, Mr. Robert Thomson, and the formation of the garden at Castleton was commenced.

Experiments were made in planting out cinchona in different parts of the Blue mountains, and at length in 1868, during the governorship of Sir John Peter Grant, the cinchona plantations were started under Mr. Thomson as "superintendent of botanic gardens" in succession to Mr. Wilson.

Six hundred acres of virgin forest land were assigned for planting cinchona by Sir J. P. Grant on the southern slopes of the Blue mountains, ranging from 4000 to 6000 feet above sea level, and a commencement of work was made in the same year

(1868) by planting out forty acres with five species of cinchona. Now also a first beginning was about to be made to realize the conception of Sir Basil Keith of nearly a hundred years before to have a "European garden" in a temperate climate. A small plantation was made in 1869 of Assam tea, and afterwards of a hybrid between the Assam and China. *Eucalyptus globulus* from Australia, *Cupressus macrocarpa* and *Pinus insignis* from California, and *Pinus excelsa* from the Himalayas are among the forest trees planted out and flourishing in later years. In 1869, 40,000 plants of cinchona were offered for sale at rates of £5 to £7 per 1000.

At Castleton, up to 1869, there had been no general importation of plants, because of doubts about maintaining the garden on account of its distance from Kingston. In the Blue Book for 1871 Sir J. P. Grant says:

The famous Jamaica botanic garden of ancient times, which was not only of the highest intrinsic value, but also was admirably situated, was sold, I believe, for a trifle, and was broken up a long time ago, in some spasmodic fit of false economy. More lately a botanic garden was established at Bath. The site was unfortunately selected, being a long day's journey from the capital. But the purchase, in 1859, of Castleton, and its formation in 1863 into a new botanic garden in substitution for the garden at Bath, which was finally abandoned in 1866, is said to have been determined upon because of serious damage caused and threatened by a water course. The selection of Castleton as the site of the new garden was also unfortunate, as it is a distance of nineteen miles from Kingston; and it is important to interest the public as much as possible in such an institution as a botanic garden. But the selection having been made, and a large number of plants having been established there, whilst the position, except in respect of its distance from the capital, is unexceptionable, it would have been unwise once more to have thrown away all that our predecessors had done for us by removal to a fourth position. It was determined therefore to treat the Castleton garden as a fixture; and as it is not too far from Kingston for a holiday excursion, to go to some little expense in its gradual embellishment, in the hope of attracting visitors to what I believe will certainly become one of the most interesting spots in the West Indies.

As soon as this determination had been arrived at in 1869, Dr. (now Sir) J. D. Hooker sent out from Kew great numbers of

new and valuable plants, 400 different species and varieties, among which were mangosteen, Brazil nut, bhel, *Monstera deliciosa*, carob bean, coca, Tonquin bean, teak, New Zealand flax, and thirty-two species of palms. In the same year two cases of grafted mangoes arrived from India *via* Kew; Mr. Thomson states that "to His Excellency the Governor, from his personal knowledge of Indian mangoes, we are obliged for their introduction." Even at this early period of its existence the nutmeg trees began to bear fruit, and the clove trees were six feet high.

In the same Blue Book quoted above, Sir J. P. Grant reports that a gardener had been obtained from Kew to reside at Castleton, as Mr. Thomson had taken up his residence at the cinchona plantations thirty-four miles off, in the Blue mountains. He took charge at Castleton in December 1870.

Upwards of 200 species of plants new to the island were introduced during the year. Among these perhaps the most interesting were two plants of Ipecacuanha, two true mangosteens, and five choice varieties of pine apple; also four noted Bombay grafted mangoes, imported two years ago, are very flourishing, some of them being already five feet high. My belief is that there is nothing to prevent Jamaica becoming, for the quality, variety, and commercial value of its fruit, the most noted spot in the world, when gardening shall be understood, and the value of the art shall be duly recognized here.

In 1870, four varieties of orange were imported, viz., navel, St. Michaels, tangerine, and mandarin. In after years thousands of grafted plants of this St. Michaels, and seedlings also of the tangerine and mandarin were distributed all over the island. A large tank was made for the cultivation of the *Victoria regia*, which has been growing there ever since.

This was a period of great importance in the history of the development of the public gardens. In 1868 the government undertook to plant out in cocoanuts the narrow sandy strip of land, known as the Palisades, with Port Royal at one end, forming a natural breakwater for the magnificent harbor of Kingston. The first clearing and planting was done early in 1869, and by 1879 nearly 20,000 cocoanut palms had been planted out, and 700 of them were bearing fruit. In 1870, £1800 was voted for

the establishment of a garden in the Parade square of Kingston, and in 1871 £2267 were voted for continuation of the work. This sterile waste in the center of the city about seven acres in extent, Mr. Thomson reports in 1871, was enclosed with a handsome iron railing. In 1871 the governor ordered that:

In an appropriate quarter of the garden at Castleton space should be reserved for every species of cane procurable, so as, if possible, to afford specimens of every true, distinct, and permanent variety known. The botanical garden of Jamaica should not be behind any garden in the world in regard to specimens of this particular sort of plant.

The governor applied to Mauritius and Martinique for specimens of all varieties of cane grown there. Over sixty varieties of sugar cane were received in 1872 and 1873 from Mauritius, and the salangore from Martinique.

In Sir J. P. Grant's report in the Blue Book for 1871, published in the *Gazette*, October 1872, he says:

The Bombay grafted mangoes, planted three years ago, are in a thriving condition, and from eight to nine feet high. I do not doubt that the finest varieties of this almost unequalled fruit will thrive here quite as well as at Bombay. The plant has naturalized itself here in the course of only ninety years, and now spreads itself self-sown over large tracts in all parts of the island. As the propagation has been exclusively from seed, it is surprising to find amongst these wild trees so many bearing fruit at all eatable, which I think could not be the case were not the climate and soil very propitious for this plant. The quantity of fruit produced is remarkable, and it is greedily devoured by horses, cattle, and swine. With vessels running in six days to New York, the commercial value of an orchard of fine Bombay mangoes near Kingston would surely be very great.

Mr. Thomson in his report for 1873, referring to these mango trees, points out that:

Although the climate of Castleton is extremely favorable for the growth of these plants, the reverse is the case so far as the production of fruit is concerned. As soon as possible, however, a small plantation of these varieties will be established at the proposed garden at Hope, which, with its far drier climate, is probably as good a locality as any in the West Indies for the production of this fruit.

In 1873, the report of the gardens states:

Arrangements have been made to commence operations at Hope, with the view of establishing a pleasure garden and a small sugar cane farm for experimenting upon new varieties of canes. The climate of the Castleton garden is too humid for numerous species of plants, which will find a congenial home in the drier climate of the Liguanea. . . . The establishment of this garden, simultaneously with that on the parade, coupled with the greatly increased command of water in the course of being brought to Kingston, must undoubtedly constitute a new era in the history of horticulture in Jamaica.

It was found advisable to secure the services of a skilled European gardener at Cinchona. Accordingly Mr. Nock arrived here in April 1874, from Kew gardens. He devoted attention to the cultivation of European vegetables, which he hoped to show may be successfully grown in great abundance and variety under our conditions of climate. Mr. Thomson says in 1875 that:

Mr. Nock has been very successful in producing an assortment of vegetables such as are not grown elsewhere in the island. It is to be hoped that the peasantry will initiate the cultivation of similar vegetables, as these experiments show that at this height (5000 feet above the sea) almost all European vegetables can be grown with advantage.

These hopes have been fulfilled, for the peasantry now grow all kinds of "English" vegetables in the Hill gardens district.

In 1876 a plantation of Liberian coffee was established at Castleton. With reference to the "Hope experimental grounds," Mr. Thompson wrote:

It is about three years since the government obtained possession of upwards of 200 acres of Hope land, contiguous to, and for the most part under the level of the Hope reservoirs. The acquisition of this land afforded an excellent opportunity for experimenting upon the numerous new varieties of canes that had just been imported from the Mauritius botanic garden. While this matter was under consideration, it was also proposed that the beautifully situated land in question should be utilized in a variety of ways. Among other schemes it was proposed that, in consideration of the accessibility of this locality to Kingston, a pleasure garden should be formed for the inhabitants of that city.

But the want of water prevented anything more being done than planting out a few canes, and forming a small nursery.

The collection of new sugar canes, embracing some sixty varieties of new

canes, imported a few years ago from the Mauritius botanic garden, was in the first place established at Castleton garden. As the necessary scope and appliances at Castleton for the experimental cultivation of these canes on a sufficiently large scale were not obtainable, advantage was taken of the government land at Hope to carry out the necessary experiments. Accordingly in 1874 the first batch of canes, consisting of eighteen varieties, was transferred to Hope and planted to the extent of nearly an acre each. In 1875 the remaining varieties at Castleton, numbering upwards of forty, were removed to Hope, and there planted in small plots in order to ensure a command of cuttings for subsequent propagation, the area occupied by these being about five acres.

But water failed often and there was disappointment. Some fifty plants of teak were set out at Hope in 1874, and 500 plants more in 1875. About ten acres were thus planted with teak.

Mr. Thomson retired on pension in 1878, and in December 1879 the gardens and plantations were constituted a department under Mr. Daniel Morris as director. The management of the gardens and grounds attached to Kings house, the residence of the governor, was now placed under the department. Dr. Morris, in his report for 1885, refers to the future development of Hope nurseries.

The only drawback to this locality as a site of a botanic garden is the smallness and precarious nature of the water supply. . . . Although sufficient for the nurseries this water supply is wholly inadequate to maintain a large area, such as a botanic garden must necessarily be, under perpetual cultivation, unless a system of reservoirs and tanks were introduced for the storage of water.

The Hope plantation might, however, be greatly extended in the direction of growing and distributing economic plants, and in this respect the establishment would prove of great service to the island. As circumstances permit, this work will be transferred as much as possible from Castleton, leaving the latter to supply only the districts in communication with the main trunk road and the north side.

The lands adjoining the Hope nurseries, about 100 acres in extent, might be cleared and laid out as a public park, with grass lawns and shade trees, and afford a convenient and healthful resort for the inhabitants of Kingston and Half Way Tree. At present, persons driving along any of the hot, dusty, and dreary looking roads leading out of Kingston have no place where they could get out of their carriages and enjoy a walk under shade. With the exception of the Parade garden, Kingston, which is largely fre-

quented by the poorer classes of people residing in the immediate vicinity, there is no place of the nature of a park in the island. In the neighborhood of every tropical city it is very necessary to have a public park provided with seats and ample shade trees where the people can for a time, at least, escape from the heat, and glare, and dust, and where they come into contact with some of the fresh invigorating influences of nature.

The cost of laying out a park at Hope in conjunction with the experimental cultivation of fruit trees and nurseries of economic plants would be about £4,000 to £5,000.

The governor, Sir Henry Norman, commenting upon this view of the future of Hope, wrote:

As regards the Castleton and Hope nursery gardens, it will be seen that there is a tendency rather to increase the usefulness of the latter than the former, and considering the inconvenient situation of Castleton this seems right. Measures may be taken from time to time to improve the Hope gardens, but I am not prepared to recommend outlay from public funds for the construction of a park at the Hope. It is situated five miles from Kingston, which is too great a distance to allow of the poorer classes of the population enjoying the benefits of the proposed park.

The scheme proposed now to connect Kingston and Hope gardens by an electric tramway with cheap fares removes the objection that the poorer classes of Kingston would not be able to make use of it.

Dr. Morris left Jamaica in March 1886 to take up an appointment as assistant director of Kew gardens. Sir H. Norman then referred to a committee of the legislature the consideration of the condition of the department, and the provision to be made for its maintenance in the future. The committee submitted a report, which was adopted by the council in October 1886. In it the committee state that they

Fully recognize the importance to a purely agricultural colony of an organized department for the giving of reliable and authoritative information in matters of agriculture and cultivation and for the dissemination of such knowledge. The importance of this is specially enhanced at the present time when the depressed condition of our staple products in the markets of the world suggests not only the application of all means of science and invention to their more perfect and more economical production, but also the encouragement of the cultivation of those so-called minor products for which

the soil and climate of this island are so fortunately suited. Courage may be taken from the experience of Ceylon, where the effects of the failure of its great staple of coffee have in a few years been largely diminished by attention to the cultivation of tea, cocoa, and other products, which has been materially benefited by the interest and fostering care of the botanical department of that island. The influence of a trained and scientific chief over such a department must be felt as well in the interchange and in the consequent continuous and careful thought of the information and experience of old and practical planters and cultivators, as in the education and training of the younger and inexperienced, and in the intelligent and profitable application of means and labor of both peasant and proprietor, to present and to new objects of cultivation.

The work of the gardens department, its chief aims and possibilities, have frequently been brought before the public of Jamaica in the present director's annual reports. Thus in 1892 occurs the following:

The two main divisions under which work in a colonial botanical department may be classed are: first, the supply of plants yielding products new to the agriculture of the colony, or of a better kind, or such as are not readily obtainable otherwise, involving experimental and nursery grounds in such situations as are suitable; second, the providing of information regarding the kind of soil, climate, etc., fitted for the plants, their proper cultivation and preparation for the markets. The second division is most economically and effectively carried on by means of printed matter combined with correspondence; but practical demonstrations of methods in the gardens are advisable whenever they can be carried out. Both divisions imply considerable correspondence with persons in other countries as well as a complete herbarium and a good library.

During the past twelve and one-half years, from the time that Mr. Morris was first made director, to March 31, 1892, about 220,000 plants have been distributed from Castleton alone, besides seeds which would produce at least as many plants. This gives an average for a year of 17,600 plants, and includes those sent to Hope for distribution from that center.

Of those plants, about half the number were such as may be termed strictly "economic," such as cocoa, nutmeg, cloves, cinnamon, Liberian coffee, vanilla, oranges, East Indian mangoes, cardamon, kola. The remainder were palms, roses, ferns, orchids, and miscellaneous trees and shrubs, among which are included timber trees.

I stated in my report for the year 1887-8 that although it was not the mission of a botanic garden to undertake the work of a horticultural establishment, and supply the public with ornamental plants, I thought it right to

do as much as possible in that direction, so long as there was no probability of interfering with private enterprise.

But the danger of interfering with trade seems remote, and the demands on the part of the public are positive and increasing. There has been an annual demand for some 8000 or 10,000 ornamental plants, and even more than the department can supply with its present means. The question may sometimes arise, is the government right in fostering this demand; is it a legitimate one; is some great end served by the necessary expenditure, and the attention to the numberless details that it implies?

It appears to me that the question only needs to be stated for all intelligent persons to answer in the affirmative. Bacon recognizes a love for gardening as an index of a nation's advance in civilization, and without doubt it is an important factor in rendering that advance more easy and more certain. He says (Essay 46), "God Almighty first planted a garden, and indeed it is the purest of human pleasures. It is the greatest refreshment to the spirits of man, without which buildings and palaces are but gross handiworks; and a man shall ever see, that where ages grow to civility and elegance men come to build stately, sooner than to garden finely; as if gardening were the greater perfection."

The plants, cuttings, and seeds, both economical and ornamental, from Castleton as well as from the other gardens, are distributed all over the island by means of the coastal steamer, the railway, and the post office.

The increase in the variety of cultural products, and the humanizing influence of ornamental plants are matters of appreciation in every part of the country from the mountain to the seacoast. Every person who obtains plants and grows them, from the sugar planter who makes trial of different varieties of cane, to the small settler who grows a nutmeg plant, is making experiments which are of direct benefit to himself and indirectly to his neighbors and to the district.

Parochial or other associations can do a great deal to help the work by meeting periodically to discuss all matters connected with agriculture. The sympathy felt between those engaged in kindred pursuits, the feeling of rivalry aroused to attain better results, the mutual aid obtained by interchanging ideas, are all most valuable in the improvement of agriculture. He who undertakes the laborious task of starting such an association in his own district, though he may find few at first to join him, yet by perseverance with even only one or two sympathizers will eventually meet with his reward. Such an association and this department can render mutual assistance to each other in many ways with results that will be of general benefit to the whole island.²

The great importance of Castleton as a botanic garden over the other gar-

² The local association work has been undertaken by the Jamaica Agricultural Society, formed in 1895.

dens may be estimated from the fact that there are some plants such as vanilla, which will only grow naturally there, and that there are others, such as roses, which can only there be successfully propagated. Castleton must therefore always be the great propagating center.

It is scarcely necessary to say anything in Jamaica about the importance generally of botanic gardens, for the need for them has been continuously recognized there for more than one hundred years. The value of those existing in Jamaica, Trinidad, and Demerara, is so evident that lately botanic gardens have been started in Antigua, Dominica, Montserrat, and St. Kitts, Nevis, among the Leeward Islands; in Grenada, St. Lucia, and St. Vincent among the Windward Islands; and still more recently in British Honduras.

The same movement is also going on in other parts of the world; for instance, botanic gardens have lately been established in Lagos, and the Gold Coast on the west coast of Africa.

Botanic gardens in the tropics do the work on the plant side of agricultural departments in temperate climates. They are in themselves experimental stations; and are much more efficient in introducing new cultural products, and in distributing plants and imparting useful information, than most agricultural departments.

The whole of the botanic gardens in the British Empire are more or less in communication with one another, exchanging seeds, publications, etc., and all look up to the Royal gardens at Kew as to their head for advice and assistance. Imperial federation is already in existence as regards the botanic gardens and their work. If any special variety of a plant or any new culture comes into notice, information and plants are sought sometimes directly from the local gardens; sometimes through Kew as the botanic gardens' clearing house. The director of Kew gardens has at his disposal the services of experts in every branch of botanical inquiry, and is always most willing to aid colonial gardens in every way. Any intricate question that arises in chemistry, in diseases of plants, in insect pests, in the value of products, etc., can be determined by reference to Kew. Colonial gardens are therefore not isolated, but are branches of an agricultural department as wide as the British Empire itself.

In 1896 the following paragraphs are found:

Although the means and the number of men at my disposal are infinitely small, as compared with the resources at the command of the government of the United States, we try to follow at a very long distance the aims and the methods adopted by them. Dr. A. C. True, the director of the office of experiment stations in the United States, has lately given a lucid exposition of the objects and work of these stations, and an extract from his bulletin will very clearly illustrate what we should always be striving after here.

Then follow extracts showing what the objects of the stations are, and details of their work :

Chemical analysis and the study of live stock are outside the limits of our sphere at the gardens, but attention is paid to nearly all the other points detailed.

Dr. True continues :

The service which the stations have rendered in promoting the education of our farmers is incalculable. Even if the station bulletins recorded only facts well known to scientists and advanced agriculturists, the influence of such a far-reaching system of popular education in agriculture must be very great. So vast a scheme of university extension has never been undertaken in any other line. The stations have also taught the farmer how to help himself.

The *Jamaica Bulletin*, which was started in a small way in 1887, appearing at irregular intervals, has now increased to a publication of twenty-four pages, appearing regularly once a month. It is sent free by post to all who ask for it, and the circulation is steadily increasing. The department, indeed, takes in some respects a wider scope than the experiment stations of the United States, for not only are practical lectures given in various parts of the island, but an agricultural elementary school is managed under its auspices, and the boys are trained in practical work in the gardens.

PARADE GARDEN.

The Parade garden was formed for the recreation of the inhabitants of the city of Kingston, the principal port of the island and the seat of government. It is about seven acres in extent, with shady lawns, lily tanks, borders of ornamental plants, and numerous palms and tropical flowering trees. It is lighted in the evenings by electric light, and a military band performs once a week. Elevation, 60 feet; annual mean temperature, 79° F.; average rainfall, 34.73 inches.

KINGS HOUSE GARDEN.

The garden and grounds around Kings house, the residence of the governor, amount in extent to 177 acres. The avenue from the entrance gate to the house is formed of the willow fig (*Ficus benjamina*), and the royal palm (*Oreodoxa regia*), with borders of ornamental shrubs and creepers, such as crotons, Hibiscus,

Acalypha, Tabernæmontana, Mussaenda, Tinnea, Bambusa, Draena, Musa, Bignonia, Antigonon, Stephanotis. In the garden, adjoining the house, there are orchids, ferns, palms, climbers, and ornamental plants generally, with several lawns, and a tank for nymphæas and the *Victoria regia*. Elevation, 400 feet; annual mean temperature, 78.7° F.; average rainfall, 48.51 inches.

HOPE GARDEN.

Hope garden is situated in the Liguanea plain between five and six miles from Kingston at the base of the hilly country through which the road passes for ten miles or so to the Blue mountains. The plain of Liguanea is one of the dry districts, the average annual rainfall at Hope being only 51.5 inches. Vegetation is affected not only by the want of rain, but also by the sea breezes, which in their passage across the plain become quite dry. The plain is characterized by the presence of Cactaceæ, such as various species of *Cereus* and *Opuntia*. The trees include *Prosopis juliflora* (cashaw or the mesquite of the mainland), *Guaiacum officinale* (lignum vitæ), *Parkinsonia aculeata* (Jerusalem thorn). As we approach Hope, at the base of the hills the rainfall increases, from 35 inches in Kingston, and *Catalpa longissima* (the yoke wood tree), and *Pithecolobium Saman* (the guango) occur, while the Cactaceæ disappear.

The character of the flora is affected also by the soil, which is alluvial without any admixture of clay. Where limestone rock commences on the hill called Long mountain, the prevailing feature is the beautiful yellow flowered *Agave Morrisii*. The soil of the plain is very fertile when irrigation can be used, and the gardens in fact form part of the old Hope sugar estate.

From being at first a small nursery and an experimental ground for sugar cane, it has now developed into a large garden with six acres of lawns, three and one-half acres of ornamental borders, also ferneries and orchid houses; collections of roses, crotons and palms; plantations covering seven and one-half acres of sugar cane, Arabian and Liberian coffee, oranges, ginger,

tobacco, ramie, and five or six acres of teak. It is hoped that in time it may be possible to make it a geographical botanic garden with different sections for India, Australia, China, etc. Two and one-half acres are given up to the nurseries which contain about 70,000 plants, such as cocoa, nutmeg, clove, orange, vanilla, cinnamon, Liberian coffee, rubber plants, etc. It is the distributing center, and on an average 40,000 plants are sent out all over the island each year. The director has a residence, office, library, and herbarium in the garden. Elevation 600 feet; annual mean temperature 74.4° F.; average rainfall 51.54 inches.

HILL GARDEN.

The following account of the possibilities for usefulness of the Hill garden was written by me eighteen months ago. The ceremony, by His Excellency the Governor, of cutting the first sod of the new driving roads along the southern slopes of the Blue mountain range, inaugurated a new era of prosperity for a wide stretch of country from Newcastle to the Cuna-cuna pass. The only means of communication, until quite lately, in all this region from one district to another and to the sea-coast road, was by bridle paths, a terror to nervous riders and impossible for invalids. The road connecting the plain of Liguanea with Gordon Town is so short that it scarcely counts when there is now a commencement of the construction of roads which are to be 100 miles in length. The only cultivation in these mountains on a large scale has been of coffee, and this industry has been seriously hampered by the expense and difficulty of transport.

In 1868, Sir John Peter Grant with great foresight made the first attempt at another culture, one which could be carried on at higher elevations, namely of cinchona. The experiment was a complete success, for the government established the fact that cinchona could be grown in the island, and realized a sum of about £17,000 by the sale of bark. But for the very reason that the whole region was without roads, planters hesitated so long about embarking in the new industry, that the golden opportunity was lost, the price of cinchona bark fell, and

many persons lost money in the venture, whereas in Ceylon, with good roads and railways, fortunes had been made by all the pioneers.

Here in Jamaica, the loss to private individuals of large sums in cinchona planting, coinciding with the low prices for coffee and general depression in trade, led to the cry some ten years ago that the Hill garden instituted by Sir J. P. Grant had proved a failure, and should be abandoned. Fortunately this desponding wail has not been generally supported in the island, nor acceded to by the government. Six or seven years ago, Mr. Thistleton-Dyer, the director of Kew gardens, gave it as his opinion that it was quite possible that the Hill garden might again become the chief botanic garden of the island, and this prophecy, unlikely though it might have seemed to most, seems now in a fair way to become fulfilled, and to justify the faith of the few. The garden is situated about half way between Newcastle and Abbey Green, and the elevation of the government property ranges from about 3000 to 6300 feet, so that greatly varied experiments can be made in cultures requiring different altitudes.

The Hill garden, however, was not devoted solely to the cultivation of cinchona. Vegetables have been grown and instruction imparted so successfully, that all the settlers round for many miles grow such "English" vegetables as peas, cabbages, carrots, turnips, potatoes, artichokes, horse-radish, cucumbers and beets. Tea has been grown of a quality declared by London brokers to be excellent, and an order has just been received from a planter for 1000 plants. Timber trees of various kinds have been planted out and tended for years, and a knowledge gained of the capabilities of different trees for use in these hills where nearly all the valuable timber has already been cut. The nurseries at present contain some thousands of seedling trees. Fodder plants have been under experiment as well as many different kinds of economic plants, which will be taken up by planters in the near future, such, for instance, as jalap, which sells at 6d per lb., orris root at 75 to 80s per cwt., China grass, a variety of ramie which can only be grown successfully in the hills, and

realizes twice the price of the tropical ramie, and fruit trees of temperate climates, and of high elevation both in the new and old worlds.

As this region is the best in the island for coffee, it is reasonable to suppose that it is the best for oranges, since the soil requirements of both are much the same. Although no tests have been made in comparing the oranges of Manchester with those grown here, many who know both, declare in favor of those grown in the Port Royal mountains where splendid fruit is produced at as high an elevation as 4100 feet.

The government has very lately established an orange experimental garden and nursery as part of the Hill garden establishment at an elevation of about 3900 feet. A large number of budded and grafted trees have been imported from Florida, and also from Rivers in England, who supplied growers in Florida and California in the early days of their groves. These are permanent stock trees, from which buds will afterwards be taken for budding on Seville and lemon stocks. Several thousand seedlings of the above stocks are being grown, also of the Jamaica sweet orange, grape fruit, tangerine and shaddock. Olives have been grown in the island for many years, but so far no fruit, or even a flower, has been produced. It is probable that this may be accounted for by their having been planted at too low an elevation. Eighty plants of the variety frantojo, which yields an excellent oil, have just been presented for trial by Lord Malcolm, of Knockalva, and these, together with others from Florida, have been put out at various elevations ranging from 3500 feet to 5500 feet.

Grape plants from Persia have been imported from California. They grow on the table-lands of Persia, have a distinctive character of their own, and are very highly spoken of by travelers. They ripen early, and as they have a firm and tough skin they will probably prove serviceable for early shipping. The native grape of Jamaica, so abundant in these hills, though of no value as a fruit, may turn out to be of special worth for grafting the more tender European varieties.

These are a few of the cultures which may be taken up when roads are made. The prosperity of Jamaica will advance by leaps and bounds with the increased production rendered possible by means of communication, and a temperate climate all the year round will be available for invalids, within a few hours' drive of Kingston. But these benefits will also attract settlers from England when it becomes known that we have a Florida and a California in an island under British rule, with all the advantages of those climates and none of the disadvantages. Elevation 3000 to 6300 feet; annual mean temperature at 4900 feet is 62-67° F.; average rainfall, 105-114 inches.

CASTLETON GARDEN.

The drive from Kingston of nineteen miles, though a long one, is full of interest. The start is made in the fresh cool air of dawn; the road leads through the plain of Liguanea with a view of the hills in the distance, bright with the ever-changing hues of early daylight. Then the ascent becomes steeper, passing by settlers' groves of cocoa, coffee, and bananas, with a sprinkling of oranges, akees, sugar-cane, annatto, and yams. The road passes over the crest at an elevation of 1360 feet at Stony hill; thence down into the valley of the Wag water, with broad alluvial stretches covered with tobacco, cultivated by Cubans; along the winding river fringed with clumps of graceful bamboo plumes, and its banks hidden by masses of creepers; past the rocks by the roadside covered with ferns, mosses, the scarlet "dazzle," and the blue Jamaican "forget-me-not," until Castleton is reached, where art shows nature at its best by world-wide selection and harmonious combination.

At the principal gate stands one of the most superbly beautiful of all trees, the *Amherstia nobilis*, which, when in flower in the spring, is worth crossing the ocean to see. Further on we see *Norantea guianensis* climbing over a large tree, and brilliant with long spikes, not of flowers but of nectar-secreting bracts; *Mesua ferrea* attracting attention not so much by its large fragrant white flowers as by the red color of the young drooping

foliage; the mangosteen with its delicious fruit; the travelers' palm of Madagascar; *Araucaria excelsa* from Norfolk island. The palmetum contains specimens of 180 species of palms with great variety of graceful forms. The water lily tank is wonderfully beautiful with its surroundings of palms, bamboos, and grassy slopes, and the placid surface of bright water on which float the symmetrical leaves of red, white, and blue lilies, and the *Victoria regia* in the center, queen of the rest. From the brightness of the still lily pool we pass to the grateful shade of the ferneries with the quick stream dancing over the stones, and then on to examine the nutmeg tree, its yellow fruit splitting and displaying the "mace," a network of scarlet covering and half concealing the brown nut; the spicy clove and cinnamon trees; the climbing vanilla and black pepper; the coffee, cocoa, and kola trees; the peculiar flowers of Couroupita and Napoleona.

There is a small hotel in the grounds of the garden, open during the winter months, and as the importance of the garden has increased, a post and telegraph office and constabulary station have been lately erected. The railway station at Annotto bay is only nine or ten miles distant.

Elevation 580 feet; annual mean temperature 76-82° F.; average annual rainfall 113.15 inches.

BATH GARDEN.

The Bath garden, forty-four miles east of Kingston, is situated in one of the most tropical districts in the island. In other places, *e. g.*, in Hanover, it could easily be imagined that the road led through some English park, until we perhaps notice the sensitive plant (*Mimosa pudica*) trailing amongst the grass, or come upon a gigantic ceiba tree with buttressed trunk and its branches stretching far and wide loaded with a whole garden of exotic epiphytes. But in the Bath district the luxuriance of the vegetation arrests the attention on all sides. The street of the village has an avenue of the Otaheite apple (*Eugenia malaccensis*), which carpets the road with its purplish-red stamens. *Spathodea*

campanulata, a large tree with reddish-orange flowers, from tropical Africa, has become quite naturalized. The upas tree and the durian both grow in the garden, as well as the talipot or umbrella palm of Ceylon (*Corypha umbraculifera*), which has fan-shaped leaves twelve feet in diameter.

The sea is only six miles off, where there is a large sheltered bay of shallow water, protected by a bold headland and small bays; here search may be made for marine algæ.

About a mile and a half from the village, by a road along the side of the gorge, we come to the famous bath dedicated to St. Thomas the apostle. It is a hot spring of mineral water, efficacious in rheumatic and gouty complaints. This gorge is an unfailing delight for its picturesque beauty, and the botanist finds something new at every step. There is a bridle path across the mountains to Port Antonio, sixteen miles distant by the Cuna-cuna pass. This pass is an easy ride of six and one-half miles from Bath through virgin forest.

The forest commences close at the other side of the village. Most of it at one time or another has probably been cut for negro provision fields, but at a distance only of two or three miles undisturbed forest can easily be found, where the palm, *Calyptranthes Swartzii*, flourishes, its stems clothed with that rare tropical American fern *Anetium citrifolium*. The John Crow, or Blake mountains, are unknown land, and it is said that the Maroons alone penetrate into their fastnesses in hunting wild pig. Inspector Thomas of the Jamaica constabulary crossed them a few years ago, and published an account of his expedition, but he is the only white man who is actually known to have ventured into them. These limestone mountains are of some considerable elevation (about 2000 feet), and are only ten miles from Bath, seven miles of which can be ridden. They ought to prove a happy hunting ground for the botanist. There are specimens of two species of tree fern, *Cyathea conquisita* and *C. pendula* in the British Museum, collected by Nathaniel Wilson who lived at Mansfield, two miles from Bath, but they have never been found since, and it is quite possible that he may have come

across them near the John Crow mountains where no botanist has ever been since his time. The soil at Bath is alluvial, deep and rich. The rainfall is heavy, being on the borders of the district which is classed by Maxwell Hall as having the heaviest fall, viz., over 100 inches in the year.

The garden is only a remnant of Nathaniel Wilson's garden, but is maintained by government as a small arboretum. It contains several trees of great interest and beauty, and is much more tropical in its aspects than any of the other gardens. Elevation 70 feet; mean annual temperature 79–85° F.

THE FLORA.

Jamaica is a paradise for the botanist, whether he specializes in algæ, fungi, mosses, ferns, or flowering plants. Of ferns there are about 450 species, and of flowering plants 2180 species; a number of both are endemic. Among the flowering plants are not only those found everywhere in the tropics, but types from North, Central, and South America, and the other West Indian islands.

Forty-four new species of mosses from a limited area in the Blue mountains have just been described in *Bulletin de l'Herbier Boissier*. A synopsis of the ferns is now appearing in the *Bulletin of Botanical Department, Jamaica*. Grisebach's *Flora of the British West Indies* is the only book that gives a connected account of the flowering plants. The flora of the whole of the West Indies is being thoroughly worked up now by Professor Urban, assistant director of the botanic garden of Berlin. The results of his labors appear in Engler's *Botanische Jahrbücher*. The monographs in continuation of De Candolle's *Prodromus* also contain later work than Grisebach's. In the *Jahrbuch* of the botanical gardens of Berlin Dr. Mez has published a monograph of the American Lauraceæ, including those of the West Indies.

ELEVATIONS.

The following table gives a general idea of the area in square miles embraced in the different zones of elevation, above sea level, in the several parishes:

Parishes	Area below 1000 feet	1000 feet to 2000 feet	2000 feet to 3000 feet	3000 feet to 4000 feet	4000 feet to 5000 feet	5000 feet and upwards	Total areas in square miles
Kingston.....	6½	2⅓	..	..	..	..	7⅙
St. Andrew.....	59	54	27	17½	8	½	166
St. Thomas.....	135	59	35	20	14	11	274
Porteana.....	94	89	40	32½	17	12½	285
St. Mary.....	110	116	19	4	..	..	249
St. Ann.....	85	337	54	..	..	..	476
Trelawny.....	166	135	32	..	..	..	333
St. James.....	139	90	5	..	..	..	234
Hanover.....	161	6	..	..	..	..	167
Westmoreland.....	235	73	..	..	..	..	308
St. Elizabeth.....	335	120	7	..	..	..	462
Manchester.....	42	134	126	..	..	..	302
Clarendon.....	314	115	45	..	..	..	474
St. Catherine.....	336	124	10	..	..	..	470
Totals.....	2217½	1,452⅔	400	74	39	24	4,207⅙

Year	Rainfall divisions				The Island
	N. E.	N.	W. C.	S.	
	In.	In.	In.	In.	In.
1870.....	110.60	83.09	102.98	61.07	89.43
1871.....	69.45	41.88	54.56	34.46	50.09
1872.....	59.42	40.79	51.50	29.02	45.18
1873.....	84.08	52.64	67.79	47.71	63.06
1874.....	97.18	68.25	62.97	47.35	68.94
1875.....	71.89	47.15	56.16	34.47	52.42
1876.....	90.38	54.71	87.33	52.99	71.35
1877.....	100.72	56.53	64.06	52.27	68.40
1878.....	104.12	62.99	72.44	66.11	76.42
1879.....	122.55	65.44	87.54	79.85	88.84
Means.....	91.04	57.34	70.73	50.53	67.41
1880.....	76.37	47.01	64.91	33.47	55.44
1881.....	91.24	49.42	75.32	58.42	68.60
1882.....	65.48	43.76	78.59	43.67	57.87
1883.....	72.30	41.52	78.19	45.02	59.26
1884.....	69.00	41.87	73.10	43.63	56.90
1885.....	70.55	52.77	72.62	43.52	59.86
1886.....	126.61	60.98	88.21	86.64	90.61
1887.....	80.25	61.07	80.14	61.16	70.66
1888.....	98.00	54.42	70.43	65.58	72.11
1889.....	99.81	56.82	75.94	64.02	74.15
Means.....	84.96	50.96	75.74	54.51	66.54

RAINFALL.

THE JAMAICA RAINFALL FROM 1870 TO 1889.

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1870.....	In. 3.99	In. 4.35	In. 3.10	In. 2.79	In. 17.38	In. 3.58	In. 4.33	In. 5.72	In. 8.05	In. 16.74	In. 12.50	In. 9.90	In. 89.43
1871.....	2.40	1.60	2.29	3.46	6.43	1.98	3.79	3.46	5.70	8.88	5.88	4.22	50.09
1872.....	3.00	2.84	3.06	2.06	5.18	2.41	2.89	5.24	4.55	6.09	3.13	4.73	45.18
1873.....	8.15	1.94	5.47	1.15	5.06	2.58	2.56	7.51	10.73	8.57	3.53	5.81	63.06
1874.....	3.44	2.20	0.61	4.40	10.65	3.96	2.51	9.65	6.82	11.69	10.52	2.49	68.94
1875.....	2.57	0.67	2.59	3.05	8.54	3.74	3.87	5.13	7.60	5.58	2.34	6.74	52.42
1876.....	6.00	0.96	1.63	4.68	8.24	5.40	8.15	5.06	5.19	11.36	8.96	5.72	71.35
1877.....	5.94	1.18	5.38	2.91	15.03	6.50	4.68	1.76	5.01	4.50	7.63	7.88	68.40
1878.....	6.35	2.80	2.78	0.70	4.86	6.63	5.85	10.80	7.43	11.29	7.32	9.61	76.42
1879.....	2.81	5.30	6.49	7.28	9.14	10.64	4.47	12.32	7.38	15.96	5.29	1.76	88.84
Means.....	4.46	2.38	3.34	3.25	9.05	4.74	4.31	6.66	6.85	10.07	6.71	5.59	67.41
1880.....	4.36	0.96	1.10	2.77	11.60	3.09	3.86	9.58	3.97	4.00	2.21	7.94	55.44
1881.....	1.22	4.01	1.30	4.63	10.28	5.56	4.77	6.21	7.68	12.08	7.52	3.34	68.60
1882.....	2.92	1.93	3.54	3.32	8.22	2.33	3.76	4.80	8.78	8.96	5.36	3.95	57.87
1883.....	5.49	3.50	4.08	3.34	5.29	4.98	3.15	5.42	7.82	8.15	5.12	2.92	59.26
1884.....	4.72	3.44	2.51	1.85	6.72	6.89	2.52	5.06	6.23	9.52	5.00	2.44	56.90
1885.....	1.73	1.49	1.47	4.73	4.90	3.32	3.02	6.19	6.22	6.37	4.74	15.69	58.86
1886.....	5.23	4.65	2.68	6.39	5.30	23.36	6.22	13.54	5.90	7.98	3.70	5.66	90.61
1887.....	6.02	2.32	2.38	4.47	9.32	8.89	7.19	6.91	5.77	8.47	8.17	0.75	70.66
1888.....	1.36	1.89	1.70	3.61	21.24	6.77	2.65	5.47	8.10	4.38	4.59	10.35	72.11
1889.....	4.78	0.90	4.19	6.71	7.82	12.52	6.08	5.12	8.20	10.49	4.37	2.97	74.15
Means.....	3.78	2.51	2.49	4.18	9.07	7.77	4.32	6.83	6.87	8.04	5.08	5.60	66.54

KINGSTON, JAMAICA.